

Claims

1. A communication system (200) comprising a system management function (236) for managing base-site  
5 resources and system throughput of data, the system management function configured to identify a number of resources, wherein the system management function is characterised by a throughput identification function to identify one or more bottleneck resources from a sub-set  
10 of system resources involved in the system throughput.
2. The communication system (200) according to Claim 1, wherein the system management function (236) selectively applies one or more quality of service  
15 processes to the identified one or more bottleneck resources.
3. The communication system (200) according to Claim 2, wherein the one or more quality of service processes  
20 comprise one or more of the following: scheduling or admission control.
4. The communication system (200) according to any preceding Claim, wherein the bottleneck resource is  
25 identified as a bottleneck resource using one of the following parameters:
  - (i) A frequency at which an overload control function is initiated for the resource; or
  - (ii) Measurement of a resource's utilisation.  
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5. The communication system (200) according to any of preceding Claims 2 to 4 when dependent upon Claim 2, wherein the bottleneck resource, and preferably other

resources from the sub-set of system resources, is/are prioritised by the system management function (236), with the bottleneck resource being allocated a high priority when selectively applying one or more quality of service processes.

6. The communication system (200) according to any of preceding Claims 3 to 5 when dependent upon Claim 3, wherein said system management function (236) is operably coupled to a scheduler for scheduling data packets for transmission, such that the data packets are added to, or removed from a data stream for transmission based on an availability capacity of the identified bottleneck resource or other resource from the sub-set of resources.

7. The communication system (200) according to any of preceding Claims 3 to 5 when dependent upon Claim 3, wherein the system management function (236) is operably coupled to an admission control function for admitting call requests to the communication system (200) such that the admission control function employs a tracking process to count a failure rate of admission attempts for a particular resource.

8. The communication system (200) according to Claim 7, wherein the bottleneck resource is identified based on said failure rate count.

9. The communication system (200) according to any of the preceding Claims, wherein the system management function (236) only applies one or more quality of service processes to the identified one or more bottleneck resources.

10. The communication system (200) according to any of the preceding Claims, wherein the throughput identification function identifies a bottleneck resource  
5 by detection of an alarm corresponding to the further resource and in response to the alarm the system management function (236) adds the further resource to a list of one or more bottleneck resources.

10 11. The communication system (200) according to Claim 10, wherein the alarm is an overload alarm and/or the detection is performed over a time interval or over a number of scheduling or admission control events.

15 12. The communication system (200) according to any of the preceding Claims, wherein the system management function (236) resource receives a number of loading measurements on a number of the resources, and in response to the measurement(s) adds a resource or a  
20 percentage of a resource to, or removes a resource or a percentage of a resource from, a list of one or more bottleneck resources, for example when a loading exceeds or falls below a loading threshold over a particular time period.

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13. The communication system (200) according to any of the preceding Claims, wherein the communication system (200) is a 3GPP wireless communication system (200) and the system management function is a radio network  
30 controller (236).

14. The communication system (200) according to Claim 13, wherein, the resources comprise one or more of the following:

- (i) A Radio network controller resource (105);
- 5 (ii) A Node B hardware/software resource (110);
- (iii) An  $I_{ub}/I_{ur}$  backhaul resource (115); or
- (iv) An air-interface resource (120).

15. A method of reducing processing power consumption in a system management function (236) in a communication system (200), wherein the method is characterised by the steps of:

identifying a number of resources that affect data throughput in the communication system;

15 identifying one or more bottleneck resources from a sub-set of system resources; and

applying selectively one or more quality of service processes, for example scheduling or admission control, to the identified one or more bottleneck resources, based on the identification of the bottleneck resource.

16. The method of reducing processing power consumption in a system management function (236) according to Claim 15, the method further characterised by a step of:

identifying a resource capacity of a number of the resources to identify the bottleneck resource.

30 17. The method of reducing processing power consumption in a system management function (236) according to Claim 15 or Claim 16, the method further characterised by the step of:

prioritising the bottleneck resource, and preferably other resources, from the sub-set of system resources for selectively applying one or more quality of service processes.

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18. The method of reducing processing power consumption in a system management function (236) according to any of preceding Claims 15 to 17, the method further characterised by the step of:

10 scheduling data packets for transmission, such that the data packets are added to, or removed from a data stream for transmission based on the bottleneck resource.

15 19. The method of reducing processing power consumption in a system management function (236) according to Claim 18, the method further characterised by the step of:

performing per-cell checks on all resources that  
20 are not the bottleneck resource to identify whether further data packets are to be scheduled.

20. The method of reducing processing power consumption in a system management function (236)  
25 according to any of preceding Claims 15 to 19, the method further characterised by the step of:

counting a failure rate of admission attempts for a particular resource to identify the bottleneck resource.

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21. The method of reducing processing power consumption in a system management function (236)

according to any of preceding Claims 15 to 20, the method further characterised by the steps of:

detecting an alarm corresponding to a resource;  
and

5 adding, in response to the alarm, the resource to a list of one or more bottleneck resources.

22. The method of reducing processing power consumption in a system management function (236)

10 according to any of preceding Claims 15 to 21, the method further characterised by the steps of:

receiving a number of loading measurements related to a number of the resources, and

15 adding, in response to said measurement(s), a resource to a list of one or more bottleneck resources resource, for example when a loading measurement exceeds a loading threshold over a particular time period; or

removing a resource from a list of one or more bottleneck resources resource, for example when a loading  
20 measurement falls below a loading threshold over a particular time period.

23. A 3GPP wireless communication system (200) adapted to support the method steps of any of preceding  
25 Claims 15 to 22.

24. A radio network controller, adapted to support the method steps of any of preceding Claims 15 to 22.

30 25. A storage medium storing processor-implementable instructions for controlling a processor to carry out the method steps of any of Claims 15 to 22.

26. A radio network controller (236) managing base-site resources and system throughput of data, the radio network controller (236) identifying a number of resources, wherein the radio network controller (236) is  
5 characterised by a throughput identification function to identify one or more bottleneck resources from a sub-set of the number of system resources involved in said system throughput.

10 27. The radio network controller (236) according to Claim 26, wherein the radio network controller (236) selectively applies one or more quality of service processes to the identified one or more bottleneck resources, for example where the one or more quality of  
15 service processes comprise: scheduling and/or admission control.

28. The radio network controller (236) according to Claim 26 or Claim 27, wherein the throughput  
20 identification function identifies a bottleneck resource by detection of an alarm corresponding to the further resource, and in response to the alarm radio network controller (236) adds the further resource to a list of one or more bottleneck resources.

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29. The radio network controller (236) according to Claim 28, wherein the alarm is an overload alarm and/or the detection is performed over a time interval or over a number of scheduling or admission control events.

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30. The radio network controller (236) according to any of preceding Claims 26 to 29, wherein the throughput identification function receives a number of loading

measurements on a number of the resources, and in response to the measurement(s) the radio network controller (236) adds a resource or a percentage of a resource to, or removes a resource or a percentage of a resource from, a list of one or more bottleneck resources, for example when a loading exceeds or falls below a loading threshold over a particular time period.

31. A communication system substantially as  
10 hereinbefore described with reference to and/or as illustrated by FIG. 2 of the accompanying drawings.

32. A method of setting up a radio link substantially as hereinbefore described with reference to and/or as  
15 illustrated by FIG. 3 or FIG. 4 of the accompanying drawings.